

FOUR NEW SPECIES OF *ANOPLDACTYLUS*
(PYCNOGONIDA) FROM THE WESTERN NORTH ATLANTIC

C. Allan Child

Miscellaneous pycnogonid collections are occasionally deposited with the U.S. National Museum of Natural History (USNM), and a new species is sometimes found among these. The following paper describes four of these new species, all of the genus *Anoplodactylus*, that have been received from different sources over the past several years.

Acknowledgment is made to the several sources, listed under material examined for each species, from which the new species were received. All material has been deposited in the USNM collections.

Anoplodactylus arcuatus, new species

Fig. 1

Anoplodactylus sp. A. Hedgpeth, 1948:236, fig. 35.

Material examined.—Curaçao; Piscadera Bay, dredge no. 3, coll. M. Rice, 12 February 1969; 1 male holotype, USNM 154801, and 2 female paratypes, same collection, USNM 154802. Florida; Dry Tortugas, Loggerhead Key, dredge haul with many seaweeds in 18 m, coll. W. L. Schmitt, 8 August 1930; 1 male paratype (damaged), USNM 154803.

Description.—Trunk moderately long, thin. First and second trunk segments completely articulated, second and third articulated only by faint brown band, third and fourth unarticulated. Lateral processes long, separated by 1 to 1½ times their diameter, armed distally with single anterior and posterior setae. Neck narrow, long. Ocular tubercle over twice as long as its diameter, rounded at tip. Eyes very large, well pigmented in alcohol. Abdomen long, inflated, extending to tip of first coxa, held almost horizontally, unarmed.

Proboscis cylindrical, slightly inflated at almost half its length.

Chelifore scape long, thin, armed with 2 or 3 dorsal setae. Chela palm rectangular, armed with few long setae. Immobile finger set at about 30° angle to palm, slightly curved, without setae or teeth. Movable finger longer, very curved, armed with 3 long ectal setae, without teeth.

Palp buds represented by low rounded tubercle on each side of neck well out on lateral processes.

Oviger long, thin, with 6 segments. Second segment with 2 or 3 short setae. Third segment more than twice length of second, armed with 2 rows of 3-5 setae. Terminal 2 segments with rows of recurved setae each

shorter than diameter of segment. Sixth segment half length of fifth, slightly bulbous.

Legs moderately thin, without tubercles; major segments armed distally with single long seta as long or longer than diameter of segment. Second coxa over twice as long as first or third, without genital spur. Femoral cement gland a long thin curved tube at distal end of femur with subcuticular part of tube extending proximally for same length as exposed segment of tube. Femur and tibiae of almost equal length. Tarsus very short, armed with single dorsal seta and several ventral setae. Propodus long, slightly curved, with distinct heel armed with 1 curved spine and 3 large setae. Sole with 4 or 5 strong curved spines, a long propodal lamina over half sole length with a few short flanking setae. Claw long, thin, curved only at base and toward tip. Auxiliaries small blunt cones.

Measurements of male holotype (in mm):

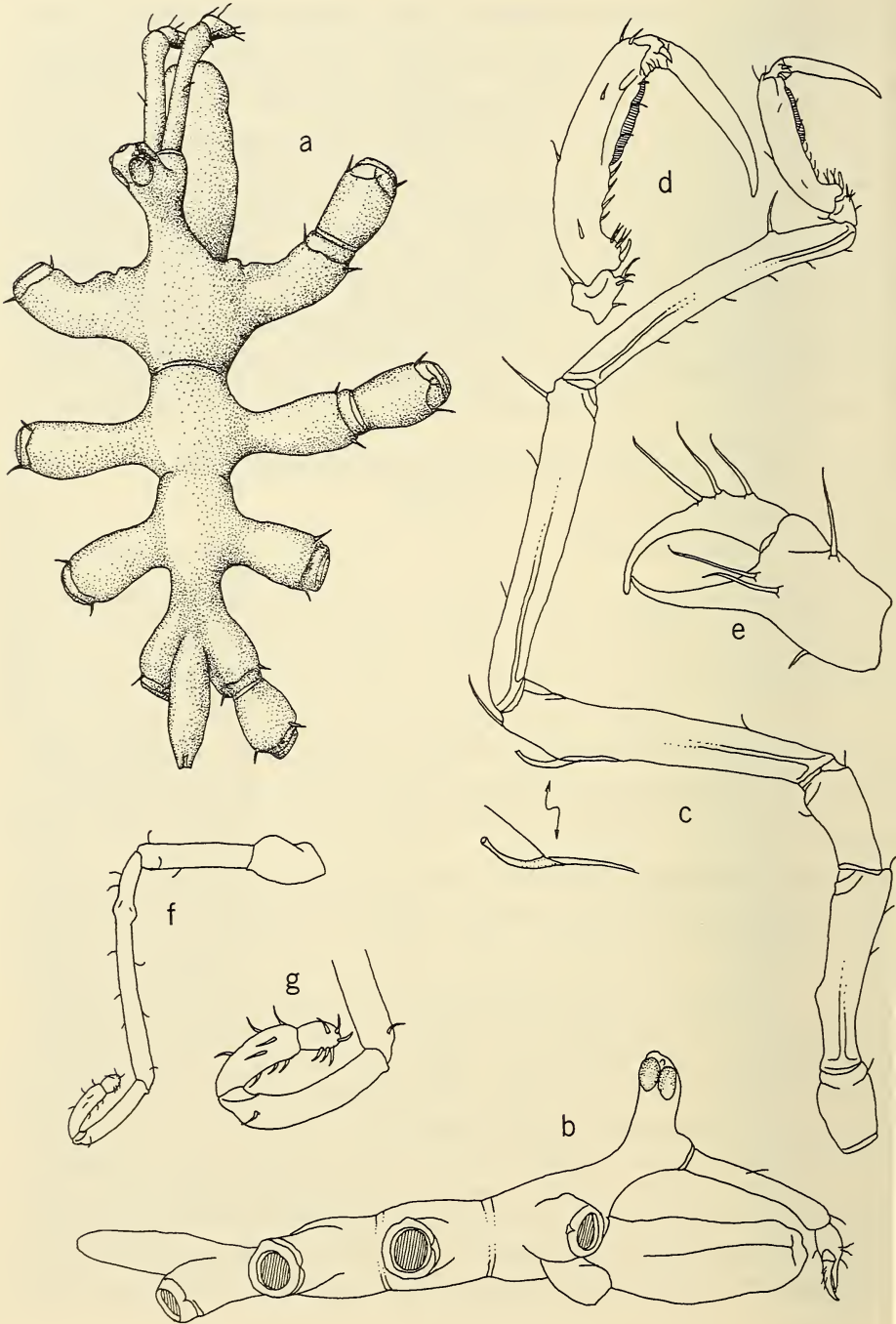
Trunk length (chelifore insertion to tip 4th lateral processes)			1.03
Trunk width (across 2nd lateral processes)			.75
Proboscis length (laterally)			.57
Abdomen length (dorsally)			.28
Third leg:		Tibia 1	.73
Coxa 1	0.22	Tibia 2	.71
Coxa 2	.58	Tarsus	.07
Coxa 3	.27	Propodus	.34
Femur	.71	Claw	.24

Distribution.—Type-locality: Curaçao, Netherlands Antilles. Depth range: Sublittoral; the only depth given is 18 m. Also found at Tortugas.

Etymology.—The proposed name alludes to the arcuate cement gland tube.

Remarks.—Hedgpeth (1948:236) was correct in calling this an undescribed species and recognizing the rarity if its cement gland placement. Like Hedgpeth, I have been unable to find a known species of *Anoplo-dactylus* with a single cement gland placed almost at the distal end of the femur. The gland is most often found halfway along the dorsal surface, sometimes even proximal to the halfway mark, or occasionally slightly beyond halfway along the femur. The tubes of both male specimens examined are extremely thin, always curved back toward the femur surface, and almost as long as the segment diameter.

Excluding the cement gland, the new species shows certain similarities to *A. pharus*, another Florida species, in the propodal shape and armature and the trunk and lateral process size and length. The differences in chela configuration and armature and the long ocular tubercle peak in *pharus* serve to differentiate this species from *arcuatus*. The new species also



shows similarities to *A. stylops*, from Indonesia. Both have long thin lateral processes, tall rounded ocular tubercles, and similarities of proboscis, legs, and ovigers. The differences are, again, in the form and placement of the cement glands and, in this case, the very long abdomen of *stylops* which extends well beyond the first coxae of the posterior trunk segment.

This species comes from 2 moderately well collected areas, but it was dredged and trawled in the sublittoral which may account for its not having been found previously.

Anoplodactylus bahamensis, new species

Fig. 2

Material examined.—Bahama Islands; Tongue of the Ocean, off Andros Island, 24°20'N, 77°33'W, by hand with SCUBA in 12 m, coll. Milligan, U.S. Naval Underwater Research Unit, Sta. 1, 25 April 1969; 1 male holotype, USNM 154804.

Description.—Trunk with first and second intersegmental lines clearly marked, no line between third and fourth segments. Lateral processes separated by less than their diameters, each armed with single dorsodistal tubercle, taller than wide, capped with 1 or 2 setae. Ocular tubercle slightly over twice as long as wide, with small blunt cap, armed with 2 large setae on each side of ocular tubercle at about midlength. Eyes large, without pigment in alcohol. Abdomen moderately long, shorter than ocular tubercle, armed with few distal setae.

Proboscis of usual cylindrical form, with slight constriction distally, armed with 5 or 6 ventral setae.

Chelifore scape thin, slightly globular. Movable finger longer than immovable finger, with greater curve, armed with 6 teeth. Immobile finger without teeth. Scape with 3 setae and fingers with 1 each.

Rudimentary palp buds present, well out distally on first lateral processes.

Oviger segment 3 only about $\frac{1}{4}$ longer than segment 2, both armed with single row of a few setae. Distal 2 segments heavily armed with setae. Terminal segment small, triangular.

Legs moderately long. Femur and tibiae with few short setae and single dorsodistal seta longer than segment diameter. Small genital spur on second coxae of fourth legs. Single femoral cement gland an oval raised cup in middle of low wide swelling. Femur with dorsodistal tubercle not extending beyond end of segment. Propodus with large heel at right angle

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Fig. 1. *Anoplodactylus arcuatus*: a, Dorsal view of trunk; b, Lateral view of trunk; c, 3rd leg, with enlargement of femoral cement gland; d, Terminal segments of 3rd leg, enlarged; e, Chela; f, Oviger; g, Terminal segments of oviger, enlarged.

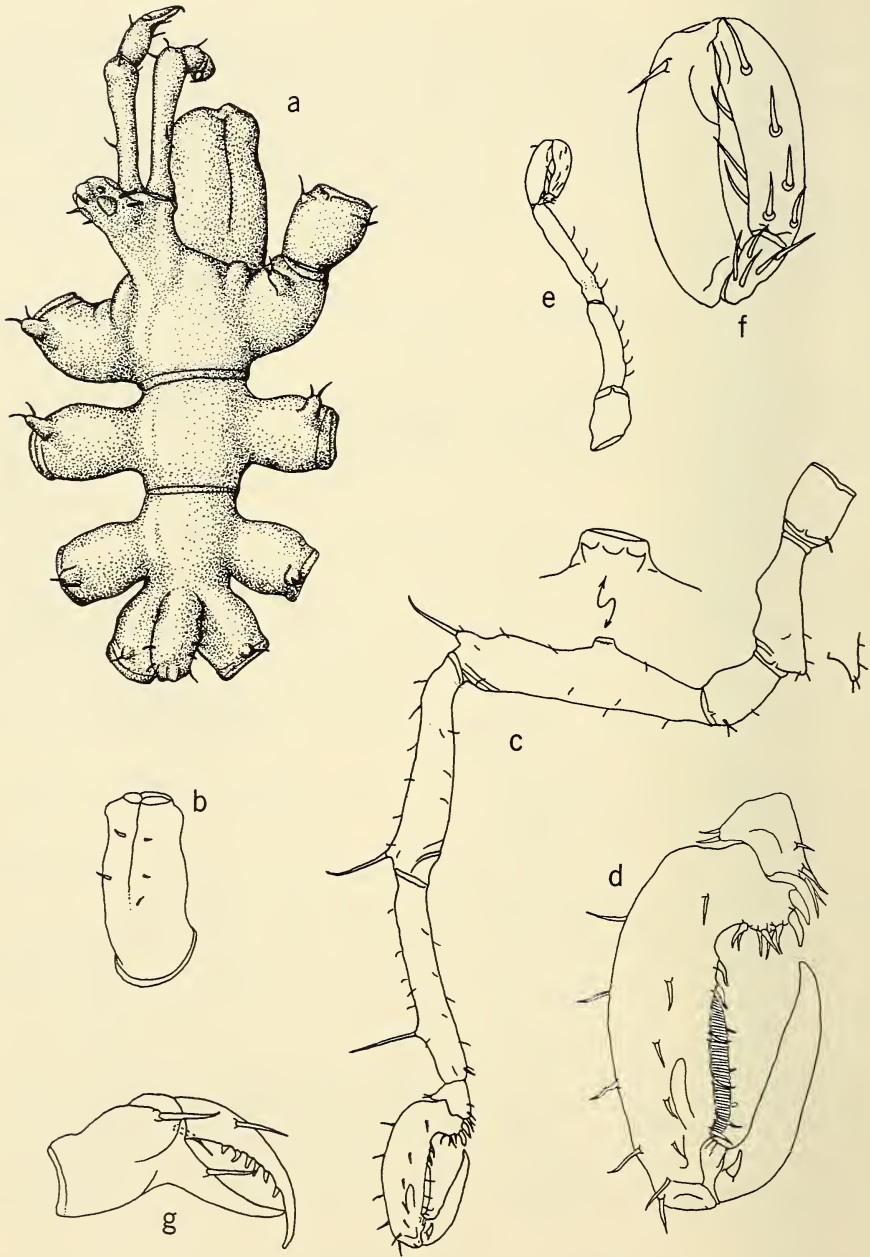


Fig. 2. *Anoplodactylus bahamensis*: a, Dorsal view of trunk; b, Proboscis in ventral view; c, 3rd leg, with enlargement of femoral cement gland and coxa spur of 4th leg; d, Terminal segments of 3rd leg, enlarged; e, Oviger; f, Terminal segments of oviger, enlarged; g, Chela.

to sole. Heel with 2 spines and 5 or 6 stout setae. Sole with lamina over half its length, 2 proximal spines and several lateral setae. Auxiliary claws moderately large.

Measurements (in mm):

Trunk length (chelifore insertion to tip 4th lateral processes)		0.97
Trunk width (across 2nd lateral processes)		.65
Proboscis length (laterally)		.47
Third leg:	Tibia 1	.61
Coxa 1	Tibia 2	.58
Coxa 2	Tarsus	.09
Coxa 3	Propodus	.42
Femur	Claw	.29

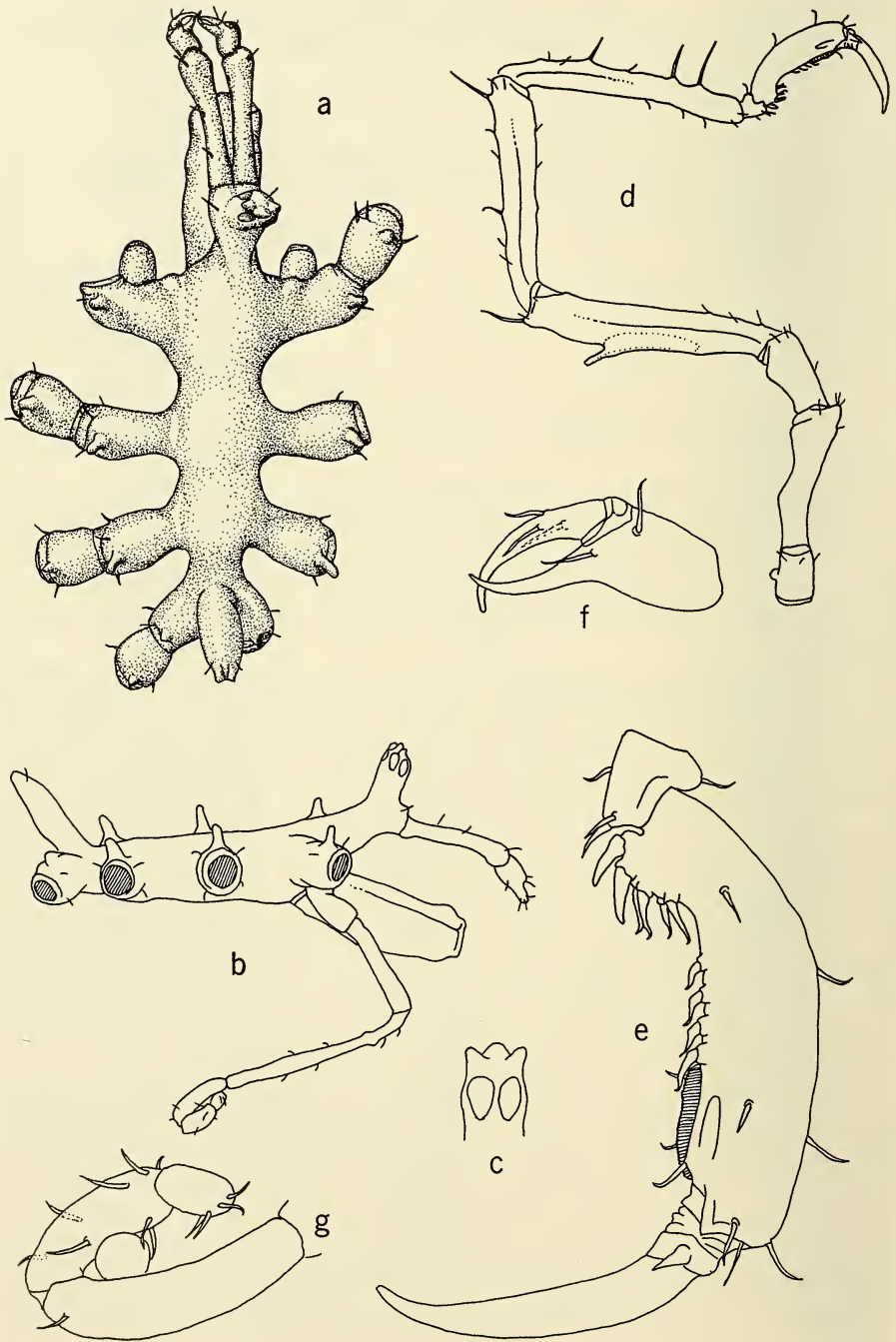
Distribution.—Type-locality: off Andros Island, Bahama Islands. Depth range: 12 m.

Etymology.—Named for the Bahama Islands, its type-locality.

Remarks.—This unique specimen was badly preserved, unfortunately, and about half of its segments have become disarticulated at the suture lines. The trunk and leg figures are therefore composite drawings of 3 separate pieces which were carefully composed for as much accuracy as possible.

This species is morphologically closest to *A. turbidus* and *spinostrum*, species found in the Indo-Pacific. It is also closely related to *A. trispinosus* and *micros* of the Atlantic. The latter species has also been found in South Australia. Unlike *spinostrum* and *micros*, this species has large lateral process tubercles and a cup-shaped femoral cement gland, but like these species, it has at least 1 denticulate chela finger. In *spinostrum*, both fingers are denticulate. The cup-shaped cement gland has thus far not been found among the smaller more compact species of *Anoplodactylus*. The new species differs from *A. turbidus* and *trispinosus* in this cement gland configuration and in trunk segmentation which is only complete for the first segment of *turbidus* and is incomplete or wanting for *trispinosus*. Trunk segmentation may be of little or no importance, as it has been shown to be variable in several species of *Anoplodactylus*.

There are other differences between *A. bahamensis* and the above species in lateral process spacing, relative lengths of oviger segments, and the presence or absence of setae on the proboscis. Stock (1975:1075-76) has grouped the above species and a few others into a "pygmaeus-complex" of closely related small forms. To this complex must be added *A. bahamensis* and *guyanensis* of this report. It would be convenient if we could apply the handy taxonomists subgeneric crutch to this genus, if a set of stable characters could be found on which to base such a classification. So far, any such characters have proven unstable as new species come to light.



Anoplodactylus guyanensis, new species

Fig. 3

Material examined.—Guyana; NE of Georgetown, 07°40'N, 57°34'W, 40 ft. flat trawl in 49–55 m, col. U.S. Fisheries R/V *Oregon*, sta. 2249, 31 August 1958; 1 male holotype, USNM 154805, 1 female paratype, USNM 154806.

Description.—Trunk without articulation lines. Lateral processes separated by width greater than their diameters, with moderately tall dorsodistal tubercle on each, armed with lateral setae. Neck narrow, laterally compressed. Ocular tubercle about $\frac{2}{3}$ abdomen length, capped with small lateral and posterior tubercles. Eyes large, well pigmented. Abdomen extends slightly beyond tip of first coxa of fourth segment, held almost erect.

Proboscis cylindrical, with median and distal swellings.

Chelifore scape long, thin, with several dorsal setae. Chela palm slender, armed with 3 or 4 setae. Fingers little longer than palm, without teeth. Movable finger with 3 ectal setae.

Palp bud represented by slight bulge halfway along anterior of first lateral processes.

Oviger long, thin, implanted at distal ends of first lateral processes. First segment projecting anteriorly, visible in dorsal view. Second segment over $\frac{1}{2}$ length of third, fourth $\frac{2}{3}$ as long as second. Terminal segment ovoid in lateral view, distally compressed in ventral view. Fifth and terminal segments armed with several setae, mostly distal.

Legs moderately long. First coxa with dorsodistal tubercle shorter than those of lateral processes. Second coxa with raised median dorsal bulge and small ventrodistal genital spur armed with 3 setae. Coxa 3 with a few ventral setae. Femur with inconspicuous dorsodistal tubercle armed with single seta as long as segment diameter. Femoral cement gland a moderately long raised tube arising from swelling at $\frac{2}{3}$ the femoral length. Cement gland tube visible beneath cuticle for over twice its exterior length, giving tube a total length of almost half the femur. Tibia 1 and 2 subequal, armed with several long and short setae dorsally. Tarsus short, typical, armed with 4 or 5 ventral setae. Propodus long, thin, with wide heel having 2 stout spines and 4 thin spines. Male sole armed with 4 recurved spines and several distal setae flanking propodal lamina shorter than half sole

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Fig. 3. *Anoplodactylus guyanensis*: a, Dorsal view of trunk; b, Lateral view of trunk; c, Anterior view of ocular tubercle, enlarged; d, 3rd leg; e, Terminal segments of 3rd leg, enlarged; f, Chela; g, Terminal segments of oviger, enlarged, with an adherent egg.

length. Female sole armed with 5 or 6 recurved spines and lamina shorter than male. Small auxilliary claws present.

Measurements of holotype (in mm):

Trunk length (chelifore insertion to tip 4th lateral processes)		0.99
Trunk width (across 2nd lateral processes)		.6
Proboscis length (laterally)		.41
Abdomen length (laterally)		.25
Ocular tubercle length		.17
Third leg:		
	Tibia 1	.59
Coxa 1	Tibia 2	.61
Coxa 2	Tarsus	.07
Coxa 3	Propodus	.28
Femur	Claw	.21

Distribution.—Type-locality: Guyana, NE of Georgetown. Depth range: From 49 to 55 m.

Etymology.—Named for its collecting locality.

Remarks.—This species can be distinguished readily from most others of the genus by the tall lateral process tubercles. There are 16 species of *Anoplodactylus* known to me with more or less conspicuous lateral process tubercles, but only 8 have additional characters similar to *A. guyanensis*. These 8 species all have their lateral processes spaced equal to or wider than their diameters, none have chela finger teeth, all have propodal lamina, and all but 1, *A. maritimus*, have auxiliary claws. The auxiliary claws of *maritimus* are sometimes vestigial, but smaller lateral process tubercles, rather globular chela palms with short fingers, and shorter ovigers and femoral cement gland tubes will serve to distinguish *maritimus* from this new species.

Of the 7 remaining species, *A. guyanensis* is separable from *simulator* by the large coxa tubercles and setose legs of the latter. It differs from *trispinosus* by having a longer and thinner proboscis, longer tubercles on more widely spaced lateral processes, and a much less curved heel with a shorter propodal lamina. The new species differs from *torus* in having longer second and fifth oviger segments, longer lateral process tubercles, and a very different propodus with a longer and thinner claw. *Anoplodactylus nodosus* is similar to *guyanensis* except for the more closely spaced lateral processes, chelifore scape tubercles, "nodose" or tuberculate legs, ocular tubercle spike, and the very reduced ovigers of Hilton's species. It is distinct from *portus* by the long coxa spurs and femur tubercles and particularly by the palp buds and "alar" processes of the female which are lacking in this new species.

The new species is perhaps closest to *A. erectus* and *petiolatus*. The cement glands of *erectus* have the same long subcuticular tube as *guyanensis*,

but it has characteristically longer lateral processes and coxa spurs and is over twice the size of the new species. The distribution of *petiolatus* includes the type locality of *guyanensis* and differs only in its larger size, shorter lateral process tubercles, longer propodal lamina, shorter subcuticular cement gland tubes, shorter leg setae, and the lack of any discernible palp bud, however small. If it were not for the conspicuously tall lateral process tubercles of *guyanensis*, these 2 specimens could be included within the variability of *petiolatus*, or at least with the "Type A" of the 2 types characterized by Stock (1975:1075).

Anoplodactylus bahamensis of this report becomes the ninth known species with conspicuous lateral process tubercles and other similarities to *guyanensis*. The differences are that *bahamensis* has very different cement glands, a more robust trunk, longer propodal lamina, a toothed movable chela finger, ventral setae on the proboscis, and a much shorter oviger. The general shape of both species is similar, including the size of the leg segments, ocular tubercle, abdomen, and the presence of the lateral process tubercles on each.

Anoplodactylus multiclavus, new species

Fig. 4

Material examined.—U.S. Virgin Islands; St. Thomas Island, 100 m W of National Park ferry dock in Vessup Bay, Pillsbury Sound, on intertidal red mangrove roots, 18°19'37"N, 64°50'56"W, coll. C. A. Child, 28 May 1967; 1 male holotype, USNM 154807.

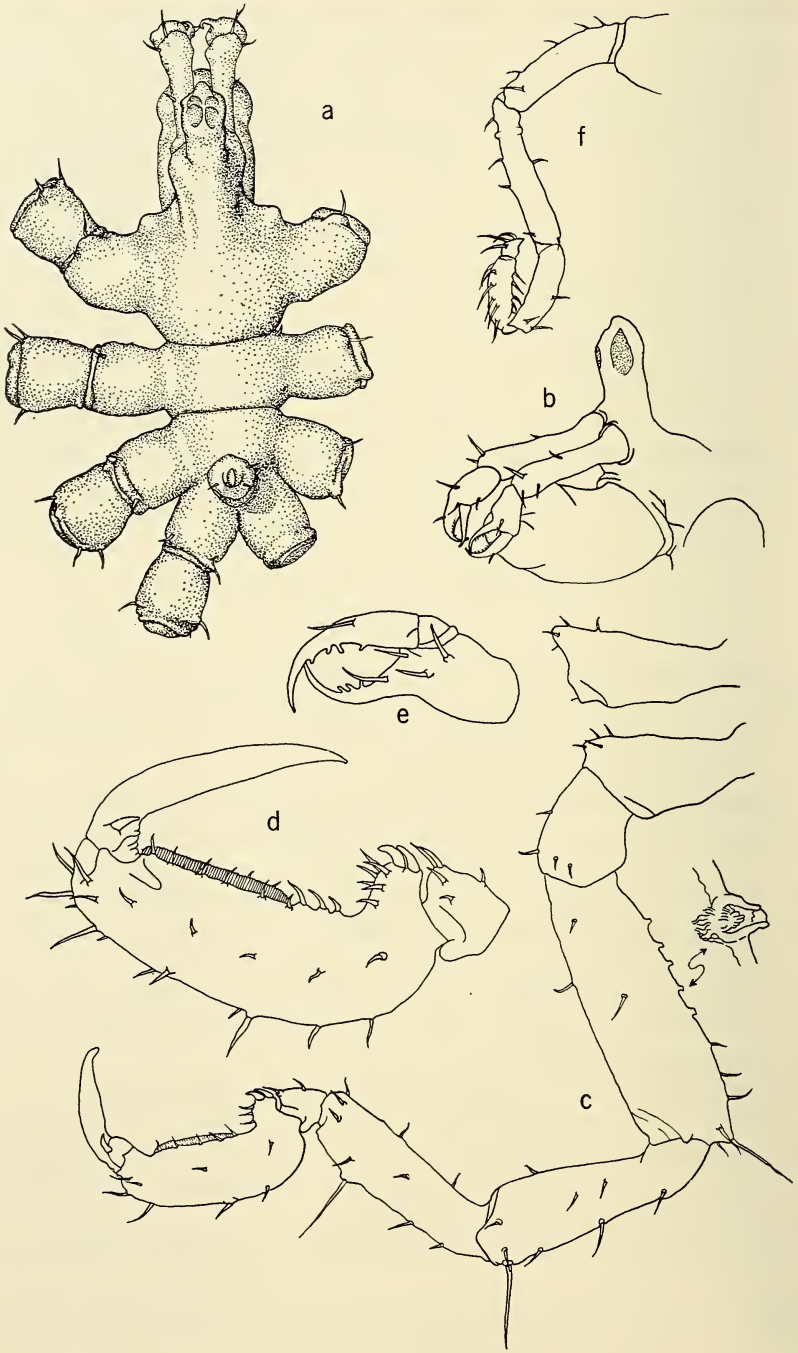
Description.—Trunk robust. First and second segments articulated, second and third with hint of articulation in slight brown line laterally, third and fourth segments unarticulated. Lateral processes separated by half their diameter or less and not much longer than their diameter, armed with 1 or 2 dorsodistal setae and a faint tubercle of differing shape on each process and absent on 1 or 2 processes. Tubercles either low and wide or narrow and slightly peaked. Ocular tubercle long, erect, capped with low truncated cone. Eyes large, well pigmented in alcohol. Abdomen long, erect, armed with several distal setae.

Proboscis cylindrical, curving dorsally, slightly inflated distally.

Chelifore scape armed dorsally and distally with 3 or 4 setae. Chela palm quadrangular, armed with 4 distal setae. Immobile finger thin, armed with 3 teeth. Movable finger thin, longer than immobile finger, armed with single ectal seta and 4 teeth.

Palp buds present as low rounded tubercles at anterior median curve of first lateral process.

Oviger second and third segments subequal, armed with few setae. Terminal 2 segments combined slightly longer than fourth segment, armed



with 2 rows of recurved setae as long or longer than segment diameter. Terminal segment a small curved cone.

Legs moderately robust, slightly setose, without tubercles; major segments with single dorsodistal seta longer than segment diameter. Third leg coxa 2 with low ventrodistal genital spur armed with 4 setae. Fourth leg coxa 2 with more pronounced genital spur extending slightly beyond segmentation line with third coxa. Femur the longest segment, first and second tibiae progressively shorter. Femoral cement glands a single row of 5 (4 on some legs) small clavate cups extending vertically from surface. Tarsus small, with a fringe of ventrodistal setae. Propodus moderately robust and setose, with large heel perpendicular to sole, armed with 2 small curved spines and 6 setae. Sole armed with 3 proximal curved spines and several short setae flanking long lamina over $\frac{2}{3}$ sole length. Claw thin, only curved proximally. Auxiliaries small, robust.

Measurements (in mm):

Trunk length (chelifore insertion to tip 4th lateral processes)			0.9
Trunk width (across 1st lateral processes)			.63
Proboscis length (laterally)			.43
Abdomen length (laterally)			.22
Third leg:		Tibia 1	.61
Coxa 1	0.21	Tibia 2	.54
Coxa 2	.29	Tarsus	.1
Coxa 3	.23	Propodus	.41
Femur	.73	Claw	.29

Distribution.—Type-locality: St. Thomas, U.S. Virgin Islands. Depth range: Intertidal.

Etymology.—Named for the multiple clavate femoral cement glands.

Remarks.—There appear to be 10 known male species of *Anoplodactylus* having multiple femoral cement glands. The female of this new species remains unknown. Only one species has more than 10 glands per femur; *A. cribellatus*. Five others, *A. pycnosoma*, *angulatus*, *oculatus*, *virescens*, and *robustus*, have multiple cement glands as flat pores of slits of varying number per species. Of the 3 other species besides *multiclavus* that have more than 1 cement gland per femur, *A. longiceps* has 2 small conical cement glands, chela fingers without teeth, and is otherwise thin and very different from *multiclavus*. Another species, *A. longiformis* (see Child, 1977:441), has

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Fig. 4. *Anoplodactylus multiclavus*: a, Dorsal view of trunk; b, Lateral view of trunk anterior; c, 3rd leg and 2nd coxa of 4th leg, with enlargement of femoral cement gland; d, Terminal segments of 3rd leg, enlarged; e, Chela; f, Ovipiger.

from 8 to 10 low cribriform glands and denticulate chela fingers, but is more like *longiceps* than *multiclavus*. The only other known species with multiple glands is *A. glandulifer*, from Singapore. The new species resembles *glandulifer* in many ways except that the latter species has 2 or 3 low conical cement glands with cribriform tips while *multiclavus* has 4 or 5 small open cups that are club-shaped in cross section. The chelifores, ovigers, and legs of these 2 species are very similar, but *glandulifer* has very pointed and conical palp buds and longer genital spurs on the fourth legs than *multiclavus*. The oviger segments of *multiclavus* are shorter and more setose than those of *glandulifer*, which also is without lateral process tubercles. The lateral process tubercles of *multiclavus* appear almost ephemeral and may be as variable as those of *petiolatus*.

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Department of Invertebrate Zoology, Smithsonian Institution, Washington, D.C. 20560.